REMARKS

Applicants respectfully request the Examiner to reconsider the present application in view of the foregoing amendments to the claims and the following remarks.

Status of the Claims

Upon entry of the present Amendment, claims 1 and 6-8 are currently pending. The Office Action is final. Claims 1 and 8 have been amended, without prejudice or disclaimer of the subject matter contained therein, to further define and clarify the invention. Support for amended claim 1 can be found within paragraphs [0009], [0032], [0075]-[0077], [0081] and the Examples found on pages 14-19 of the present specification. Support for amended claim 8 can be found within paragraphs [0032], [0041], [0075]-[0077], [0081] and the Examples found on pages 14-19 of the present specification.

Based upon the above considerations, entry of the present Amendment is respectfully requested.

Issues Under 35 U.S.C. § 103(a), Obviousness

Claims 1 and 6-8 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Yamada *et al.*, U.S. Patent No. 6,723,682 (hereinafter "Yamada") in view of Yoshimura *et al.*, U.S. Patent No. 6,458,748 (hereinafter "Yoshimura") and Iwasaki *et al.* U.S. Patent No. 4,844,734 (hereinafter "Iwasaki"). Applicants respectfully traverse this rejection.

The Examiner asserts that Yamada teaches water dispersible granules comprising flumioxazin, a polycarboxylate surfactant, another surfactant (cationic or anionic), and a mineral

carrier, such as, calcium carbonate. The Examiner also asserts Yamada teaches preparation of water dispersible granules as indicated (See page 4 of the Office Action dated February 2, 2009; hereinafter "Office Action). The Examiner also asserts that Yamada's water dispersible granules have good disintegrability in water and can be diluted to a varied amount dependent on weeds, crops, timing of application, *etc.*

Although the Examiner states that Yamada does not teach the instant acidic pesticidal active agent and cationic surfactant, the Examiner asserts that the above are taught within Yoshimura and Iwasaki. Applicants respectfully disagree.

Although Applicants do not agree, in order to advance prosecution, claim 1 has been amended, without prejudice or disclaimer of the subject matter contained therein, to further clarify that the presently claimed granular pesticide composition comprises a disintegrable part and a non-disintegrable part. The non-disintegrable part contains a first acidic pesticidal active ingredient, a cationic surfactant and a basic substance, while the disintegrable part contains a second pesticidal active ingredient selected from compounds other than the first acidic pesticidal active ingredient in the non-disintegrable part.

Graham v. John Deere, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), has provided the controlling framework for an obviousness analysis. A proper analysis under § 103(a) requires consideration of the four *Graham* factors of: determining the scope and content of the prior art; ascertaining the differences between the prior art and the claims that are at issue; resolving the level of ordinary skill in the pertinent art; and evaluating any evidence of secondary considerations (*e.g.*, commercial success; unexpected results). 383 U.S. at 17, 148 USPQ at 467.

M.P.E.P. § 2143 sets forth the guidelines in determining obviousness. But before the Examiner can utilize these guidelines, the Examiner has to take into account the factual inquiries set forth in *Graham v. John Deere*; *supra*. To reject a claim based on the above mentioned guidelines, the Examiner must resolve the *Graham* factual inquiries. MPEP §2143.

If the Examiner resolves the *Graham* factual inquiries, then the Examiner has to provide some rationale for determining obviousness, wherein M.P.E.P. § 2143 sets forth the rationales that were established in *KSR Int'l Co. v Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007).

Applicants respectfully submit that the Examiner has not appropriately resolved the *Graham* factors, including the factors of determining the scope and content of the prior art and ascertaining the differences between the prior art and the claims that are at issue. Based on the following, Applicants maintain that the above mentioned *Graham* factors actually reside in Applicants' favor. Additionally, Applicants submit that since the Examiner did not resolve the *Graham* factors, the rationale the Examiner provides for combining the cited references is improper.

Applicants respectfully submit that the presently claimed invention is distinct from and unobvious over Yamada combined with Yoshimura and Iwasaki.

The present invention

The present invention relates to a granular pesticide composition, which comprises a disintegrable part and a non-disintegrable part that can sustain-release an acidic pesticidal active ingredient. The non-disintegrable part is not disintegrated in water and keeps the original granular form for at least 30 minutes. The sustained-releasability of the non-disintegrable part is accomplished by using an acidic pesticidal active ingredient, a cationic surfactant that is capable of

forming a gel in water, and a basic substance. The presently claimed granular pesticide composition, after being applied in a farm field (or particularly, in a paddy field), is settled in water and is disintegrated within 30 minutes; the second pesticidal active ingredient therein dissolves, while the non-disintegrable pesticide granules as the non-disintegratable part of the pesticide composition disperse to the surface of the soil. The pesticide granules of the non-disintegratable part are disintegrated afterwards and the first acidic pesticidal active ingredient contained therein dissolves. That is, the granular pesticide composition of the present invention allows sustained-release dissolution of the pesticidal active ingredients from the non-disintegratable part.

It has been long desired to have in a single pesticide preparation a technique to control pesticidal active ingredients, which have both a prompt release of one pesticidal active ingredient, as well as a sustained-release of another pesticidal active ingredient from a single granular pesticide composition.

The granular pesticide composition of the present invention can be prepared by a simple and easy method and enables dissolution control respectively needed for each pesticidal active ingredient to be compounded, and thereby show stable efficacy of pesticidal active ingredients for a long period of time. Also shown is the capability of exhibiting stable efficacy against objective pests and weeds, with a decrease in or prevention of chemical damage to target crops by optimizing the required amount of a pesticidal active ingredient and not using more than required so as to reduce the load on the environment.

Differences between the invention and the prior art

Applicants respectfully submit that it does not appear that the Examiner considered that the

presently claimed granular pesticide composition comprises a disintegrable part and a non-disintegrable part. Applicants submit that the non-disintegrable part contains a first acidic pesticidal active ingredient, a cationic surfactant that is capable of forming a gel in water, and a basic substance, while the disintegrable part contains a second pesticidal active ingredient selected from compounds other than the first pesticidal active ingredient (*See* enclosed Exhibit 1 : Mechanism for the Inventive Granular Pesticide Composition, 2 pages; previously filed on November 7, 2008).

Applicants also bring to the Examiner's attention enclosed Exhibit 2 (Original and Partial Translation of Pesticide Formulation Technology, A-2-(3) Surfactants, pp. 25-28, (updated August 28, 2001)) and enclosed Exhibit 3 (Original and Partial Translation of Guidebook to Pesticide Formulation, Japan Plant Protection Association, front cover, page 104 (1997)) that support what is known in the art regarding cationic surfactants.

Applicants submit that as defined, surfactants are substances which contain hydrophobic (lipophilic) groups and hydrophilic groups in one molecule and are capable of adsorbing at the interface between gas/liquid, liquid/liquid and liquid/solid so as to remarkably change the property of the interface. Further, the remarkable change of the property of the interface by a surfactant causes various effects such as emulsification, solubilization, hydration, dispersion, adhesion, spreading, penetration, disintegration and lubrication (*See* enclosed Exhibit 3).

With regards to the disclosures in Yamada and Iwasaki, the Examiner admits that the compositions of Yamada and Iwasaki have good disintegrability in water. In view of Exhibit 3, it is natural that the compositions of Yamada and Iwasaki have such a property.

Both Exhibits 2 and 3 separately teach that cationic surfactants contribute to the solubility of the pesticidal active ingredient in a sustained-released manner.

Applicants submit that the non-disintegrable part of the present invention, which contains a first acidic pesticidal active ingredient, has the controlled dissolution of the pesticidal active ingredient even though the non-disintegrable part contains a cationic surfactant. The reason for this is that the non-disintegrable part also contains a first acidic pesticidal active ingredient and a basic substance. The first acidic pesticidal active ingredient within the non-disintegrable part releases protons in water, and forms ion pairs with a cationic surface active agent which successively controls the dissolution of the first acidic pesticidal active ingredient (*See* enclosed Exhibit 1). In order to obtain a more stable dissolution rate of the non-disintegrable part, it is preferable that a cationic surfactant is gelled in water, *i.e.*, the claimed cationic surfactant. The basic substance in the non-disintegrable part plays a role in controlling the pKa value of the first acidic pesticidal active ingredient.

As indicated in the present specification in paragraph [0074], a test for dissolution in water was performed. Each of the granular pesticide preparations of Examples 1-6 and Comparative Examples 1-4 was applied to a water-filled Petri dish at the prescribed amount. Water samples were taken 1, 3, 7, 21 and 35 days post treatment and were subsequently analyzed by HPLC analysis in order to determine the concentration of the ingredient as the rate of dissolution in water.

Each composition in Examples 1, 2, and 5 contain the same active ingredient as Comparative Examples 1-3, respectively. The difference between the compositions of the Examples and the Comparative Examples is in whether a cationic surfactant is present or not.

Applicants submit that when a comparison is made between the compositions of Examples 1, 2, and 5, to that of Comparative Examples 1, 2 and 3, respectively, and keeping in mind the discussion above, the data within Table 1 of the present specification provide examples of

unexpected results.

For the following discussion, and for the convenience of the Examiner, Table 1 of the present specification is reproduced below.

Table 1

	Pesticidal active ingredient	1 Day	3 Days	7 Days	21 Days	35 Days
Example 1	Bensulfuron-methyl	53	67	81	90	87
	Mefenacet	21	42	72	86	90
Example 2	Compound A	15	27	55	67	76
	Fentrazamide	85	96	98	100	98
Example 3	Compound A	21	32	45	59	68
	Pentoxazone	16	19	29	30	34
Example 4	Compound A	42	55	67	88	87
	Cafenstrole	43	73	93	96	100
Example 5	Compound B	12	19	38	70	89
	Pyriminobac-methyl	84	86	90	91	93
	Pentoxazone	24	30	42	41	48
Comparative Example 1	Bensulfuron-methyl	95	95	100	94	90
	Mefenacet	19	39	75	92	84
Comparative Example 2	Compound A	100	100	98	100	96
	Fentrazamide	49	65	82	100	96
Comparative Example 3	Compound B	100	98	97	100	97
	Pyriminobac-methyl	70	85	96	98	100
	Pentoxazone	6	11	19	21	25

As indicated in Table 1, Examples 1-5 show that the rates of in-water dissolution of the sulfonylurea-based compounds, the difluoromethanesulfonylanilide derivatives, or salts thereof as the herbicides for the pesticidal active ingredient (a) were running low in the tests from 1 day through 35 days post treatment as compared with Comparative Examples 1-3.

For example, after each example was dropped in water, the granular pesticide composition of

Comparative Example 1 had 95% of its bensulfuron-methyl dissolved after one day. In contrast Example 1 had only 53% of its bensulfuron-methyl dissolved after day 1. For Comparative Example 2, 100% of its Compound A dissolved after one day, while Example 1 had only 15% of its Compound A dissolved after day 1. Each of the examples indicates a sustained release over time for the non-disintegratable part of the granular composition.

In addition, as to the pesticide compositions of Examples 1 and 2, although the acidic pesticidal active ingredient was sustained-release as compared with the pesticide compositions of Comparative Examples 1 and 2, other pesticidal active ingredients are not influenced by the dissolution control mechanism and indicate the equivalent rate of the in-water dissolution.

As to Example 5, although the acidic pesticidal active ingredient is sustained-release as compared with the pesticide preparation of Comparative Example 3, the rate of in-water dissolution of other pesticidal active ingredients can be enhanced.

Therefore, based on the unexpected results provide above, the presently claimed invention is not obvious from the combined cited references.

Additionally, Applicants also note that the flumioxazin disclosed in Yamada is not acidic, therefore Applicants contend that the combinations of the references cited by the Examiner would not have the dissolution control for each pesticidal active ingredient as in the present invention.

Further, Applicants submit that the cited references, either separately or in combination, do not teach both a disintegrable part and a non-disintegrable part granular pesticide composition.

The references separately or in combination show how a pesticide could be combined with other materials to produce a water dispersible pesticide. A skilled artisan is taught by Yamada, in view of Yoshimura and Iwasaki, how to make and prepare water dispersible compositions, not a

granule pesticide composition which has a sustained-release non-disintegrable part that does not disintegrate in water in less than thirty minutes. Additionally, Yamada, in view of Yoshimura and Iwasaki do not teach a non-disintegrable part of a granule pesticide composition with the three particular elements from the present invention. Also, Applicants contend that Yamada, in view of Yoshimura and Iwasaki, have opposite characteristics of the non-disintegrable part of the present invention, which has the distinct characteristic of sustained release of the active pesticidal ingredient in the non-disintegrable part of the sustained release granular composition.

While patents or references are relevant as prior art for all they contain, they cannot be relied upon to teach embodiments that are not reasonably suggested to one having ordinary skill in the art. *See Merck & Co. v. Biocraft Laboratories*, 874 F.2d 804 (Fed. Cir. 1989). In this regard, such hypothetical embodiments are being generated here to achieve the present invention when the Examiner is taking only pieces of each reference and disregarding other essential disclosures of the references. Thus, the cited references are relevant as prior art for all they contain but at the same time cannot be relied upon to teach embodiments that are not reasonably suggested to one having ordinary skill in the art. *See Merck & Co.; supra.*

Accordingly, the Examiner must dissect bits and pieces from each of the three different references, directed to solving different problems, and is combining these bits and pieces together in an attempt to create a combination and method similar to that defined by the claims of the present application. Thus, through a process of impermissible hindsight reconstruction, the Examiner is completely reconstructing the teachings of the references in view of the Applicants' own disclosure. (*See, Grain Processing Corp. v. American Maize-Products Co.*, 840 F.2d 902, 907, 5 U.S.P.Q.2d 1788, 1792 (Fed. Cir. 1988), stating "Care must be taken to avoid hindsight reconstruction by using

'the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claims in suit,'" internal citation omitted; and *In re Fine*, 837 F.2d 1071, 1075, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988), stating "One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.").

Further, Applicants submit that based on the above, there is no motivation to modify Yamada to that which is disclosed in Yoshimura and/or Iwasaki. Applicants also contend that there is no motivation to modify Yamada, in view of Yoshimura and Iwasaki, with the specific components in such a way as described in the presently amended claims as the Examiner asserts.

In view of the above, it is submitted that the present invention as claimed is suitably distinguished over the combination of references cited.

Applicants respectfully disagree with the Examiner that the present invention would be obvious to the skilled artisan. In view of the above, it is submitted that the present invention as claimed is suitably distinguished over the combination of references cited.

In light of the presently amended claims and remarks, because there is no disclosure, teaching, suggestion, reason or rationale provided in the cited references that would allow one of ordinary skill in the art to arrive at the instant invention as claimed, it follows that the same references are incapable of rendering the instant invention obvious under the provisions of 35 U.S.C. § 103(a). Based upon the above, and applying the *Graham factors* analysis test, it is submitted that a *prima facie* case of obviousness has not been established.

Applicants contend that the secondary references Yoshimura and Iwasaki do not cure the deficiencies of Yamada. Therefore, the combinations of Yamada and the above mentioned

references do not arrive at the present invention. Based upon the above, and applying the *Graham factors* analysis test, it is submitted that a *prima facie* case of obviousness has not been established.

Applicants respectfully request reconsideration and withdrawal of the present rejection.

CONCLUSION

Applicants respectfully submit that all of the rejections raised by the Examiner have been overcome, and that the present application now stands in condition for allowance.

Should there be any outstanding matters that need to be resolved, the Examiner is respectfully requested to contact Paul D. Pyla at the telephone number below, in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized to charge payment or credit any overpayment to Deposit Account No. 23-0975 for any additional fees required under 37.C.F.R. §§1.16 or 1.17.

Respectfully submitted,

Hayase YAMASHITA *et al.*

By: #59,228
Paul D. Pyla
Registration No. 59,228
Attorney for Applicants

Attachments: Exhibit 1 : Mechanism for the Inventive Granular Pesticide Composition, 2 pages.

Exhibit 2: Original and Partial Translation of Pesticide Formulation Technology, A-2-(3) Surfactants, pp. 25-28, (updated August 28, 2001).

Exhibit 3: Original and Partial Translation of Guidebook to Pesticide Formulation, Japan Plant Protection Association, front cover, page 104 (1997).

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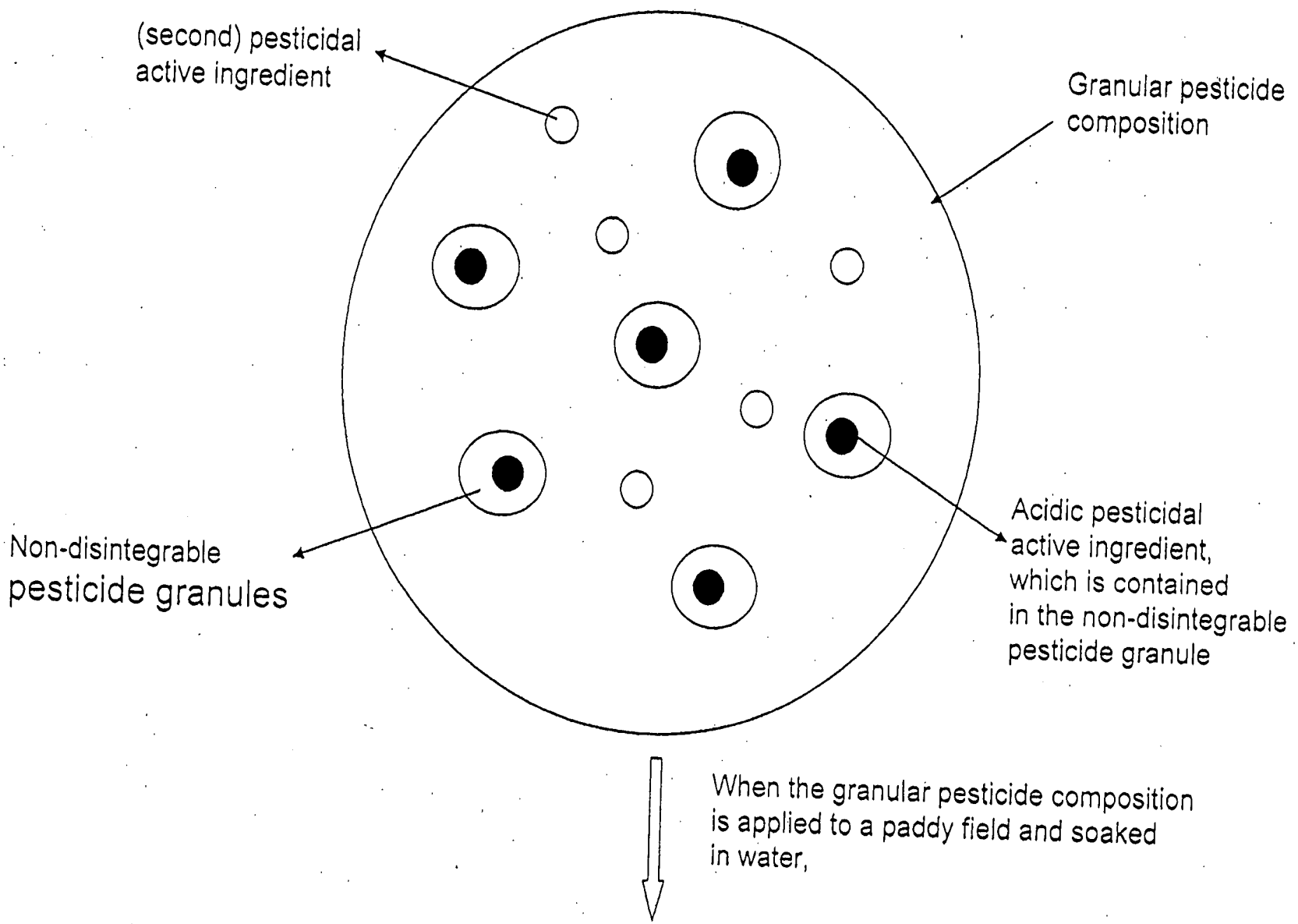
July 2, 2009

EXHIBIT 1

(2 pages total)

Mechanism for the inventive granular pesticide composition



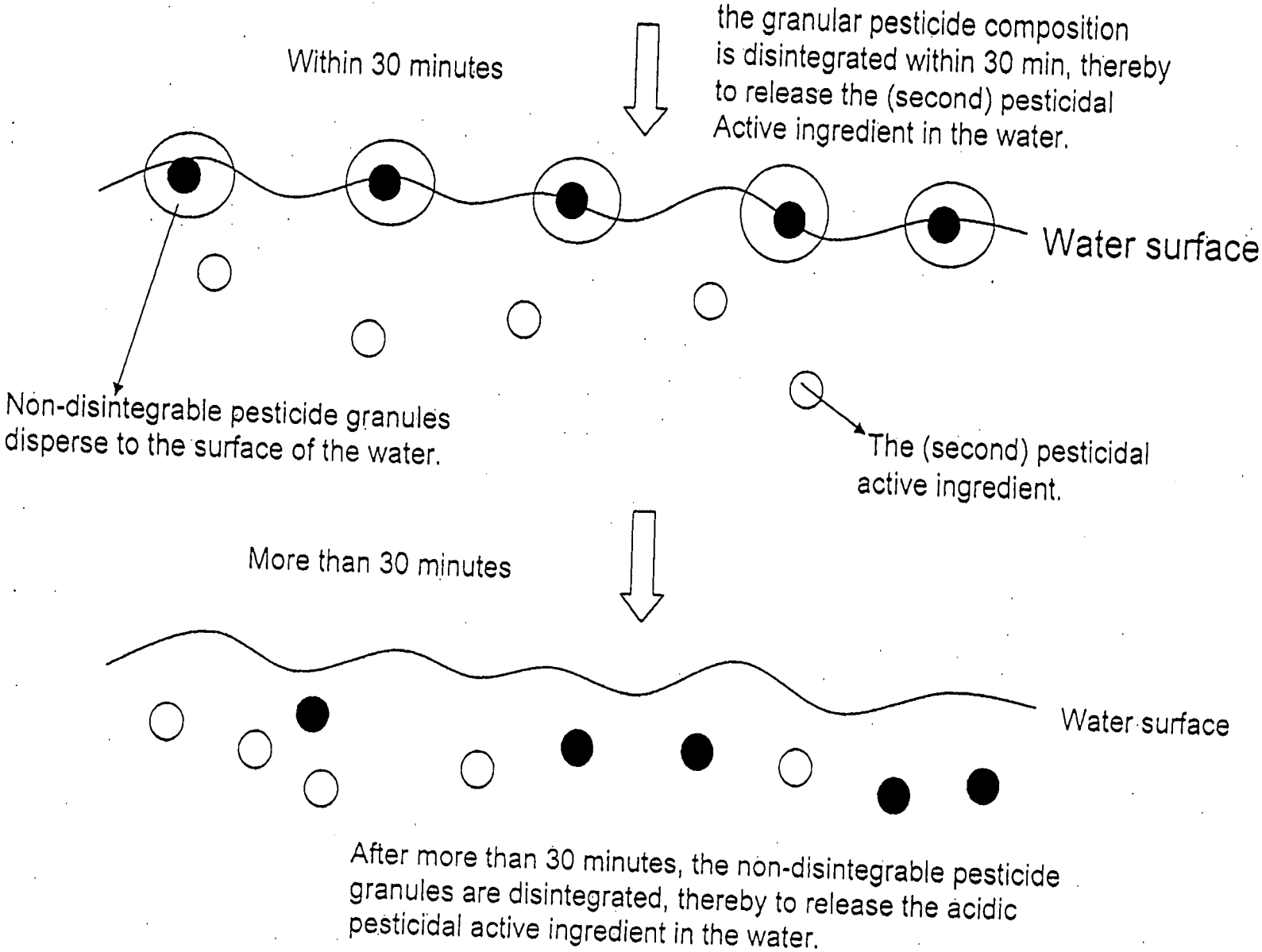

Within 30 minutes
the granular pesticide composition is disintegrated within 30 min, thereby to release the (second) pesticidal Active ingredient in the water.
Water surface
Non-disintegrable pesticide granules disperse to the surface of the water.
The (second) pesticidal active ingredient.
More than 30 minutes
Water surface
After more than 30 minutes, the non-disintegrable pesticide granules are disintegrated, thereby to release the acidic pesticidal active ingredient in the water.

EXHIBIT 2

(3 pages total)

(page 1)

[source]

Japan Patent Office website http://www.jpo.go.jp/indexj.htm

Pesticide Formulation Technology

[Updated August 28, 2001]

(page 27)

[Classification of technology]
A-2-(3) Surfactant
[Title of technology]
Cationic surfactant

[Content of technology]
A cationic surfactant is often used for promoting solubility and bactericidal and insecticidal activities of the agrochemically active ingredient. Table 1 shows typical cationic surfactants.

Table 1 Classification of cationic surfactant

Classification	Name
Ammonium type	alkyltrimethylammonium chloride (C_{12-18}), methyl poly(oxyethylene) alkyl ammonium chloride (C_{12-18}), alkyl N-methyl pyridium bromide (C_{12-18}), mono- or dialkyl (C_{12-18}) methylated ammonium chloride, alkyl (C_{12-18}) pentamethyl propylene diamine dichloride, etc.
Benzalkonium type	alkyl dimethyl benzalkonium chloride (C_{12-18}), benzetonium chloride (octyl phenoxy ethyoxy ethyl dimethyl benzyl ammonium chloride), etc.

The cationic surfactant forms a positive ion, i.e. ammonium ion or benzalkonium ion, when dissociated in water. It *per se* has, in addition to baiological effects such as fungicidal and insecticidal effects, a greatly excellent solubilizing effect. Therefore, it is used as an auxiliary for dissolution of the active ingredient in a formulation process.

農薬製剤技術

目　次

［更新日　2001.8.28］

【技術分類】
A—2－（3）　界面活性剤
【技術の名称】
カチオン性界面活性剤

【技術内容】
カチオン性界面活性剤は、水中で疎水基がカチオンになり、農薬原体の溶解や殺菌、殺虫などの効力促進などに用いられることが多い。表1に主要なカチオン性界面活性剤を示す。

表1　カチオン性界面活性剤の分類

分　類	化学構造および名称
アンモニウム型	アルキルトリメチルアンモニウムクロライド（$C_{12\sim18}$），メチル・ポリオキシエチレン・アルキルアンモニウムクロライド（$C_{12\sim18}$），アルキル・N-メチルピリジウムブロマイド（$C_{12\sim18}$），モノまたはジアルキル（$C_{12\sim18}$）メチル化アンモニウムクロライド，アルキル（$C_{12\sim18}$）ペンタメチルプロピレンジアミンジクロライドなど
ベンザルコニウム型	アルキルジメチルベンザルコニウムクロライド（$C_{12\sim18}$），ベンゼトニウムクロライド（オクチルフェノキシエトキシエチルジメチルベンジルアンモニウムクロライド）など

水中にてアンモニウムイオンもしくはベンザルコニウムイオンの陽イオンに解離し、カチオン性界面活性剤自体、殺菌、殺虫作用などの生物学的作用を有しているが、非常に優れた溶解補助作用をもっているので原体の溶解などの製剤プロセスにおける助剤として使われる。

勿論単独で使われるだけでなく複合の組み合わせで使われることも多いが、アニオン性界面活性剤との併用の場合、界面活性作用を著しく低下させる特徴を有している。

【図】

【応用分野】
殺菌、殺虫などを含めた農薬の協力剤および農薬の製剤化担体（溶解補助剤）

【出典／参考資料】
「農薬製剤の副資材　界面活性剤」、「農薬製剤ガイド」、（1997年）、日本農薬学会　農薬製剤・施用法研究会編、（社）日本植物防疫協会発行、104頁～107頁

【技術分類】
A－2－（3）　界面活性剤
【技術の名称】
両性界面活性剤

【技術内容】
界面活性剤は同一分子内に疎水性基と親水性基をもって界面の特性を変えるところから、可溶化、乳化、水和、分散、湿潤などの諸効果を発揮し、農薬の製剤化には必須の添加剤である。なかでも両性界面活性剤は疎水基にカチオンとアニオンの双方が付いている界面活性剤で、アルカリ性ではアニオン性、酸性ではカチオン性として作用する。農薬用途以外の工業分野では広く利用されつつあるが、農業分野ではこれからの使用が増えるものと思われる。

両性界面活性剤にはベタイン型とグリシン型とがある。ジアルキル（$C_{8\sim12}$）ジアミノエチルベタイン、アルキル（$C_{12\sim18}$）ジメチルベンジルベタイン、ジアルキル（$C_{8\sim12}$）ジアミノエチルグリシン、アルキル（$C_{12\sim18}$）ジメチルベンジルグリシンなどである。

EXHIBIT 3

(4 pages total)

(front page)

Guidebook to Pesticide Formulation

Edited by Pesticide Science Society of Japan and
Committee of Japan Agricultural Formulation and Application

1997

Japan Plant Protection Association

(the inside of the front cover)

Guidebook to Pesticide formulation

Printed on October 24, 1997
Issued on October 30, 1997

Edited by Pesticide Science Society of Japan
Committee of Japan Agricultural Formulation and Application

Issued by Japan Plant Protection Association

Printed by Kabushiki Kaisha Hakuhousha

(page 104)

3. Surfactant

(1) Definition of surfactant

Defined as surfactants are substances which contain hydrophobic (lipophilic) groups and hydrophilic groups in one molecule and are capable of adsorbing at the interface between gas/liquid, liquid/liquid and liquid/solid so as to remarkably change the property of the interface. The remarkable change of the property of the interface by a surfactant causes various effects such as emulsification, solubilization, hydration, dispersion, adhesion, spreading, penetration, disintegration and lubrication. In expectation of such an effect, surfactants are employed in any types of formulations for pesticide.

(2) Type and classification of surfactant
(translated from lines 15 to 13 from the bottom)

A cationic surfactant is a surfactant wherein a hydrophobic group part becomes positive when ion-dissociated in water. Typical ones include quaternary ammonium salts which are effective for promoting solubility and activity of the agrochemically active ingredient.

農薬製剤ガイド

日本農薬学会　農薬製剤・施用法研究会　編

1997

社団法人 日本植物防疫協会

農薬製剤ガイド

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振替 00110−7−177867番

印刷 株式会社 白峰社

3．界面活性剤

(1) 界面活性剤の定義

同一分子中に疎水基（親油基）と親水基をもち，気体／液体，液体／液体，液体／固体などの界面に吸着して界面の性質を著しく変える物質を界面活性剤という。界面の性質を著しく変える結果，乳化，可溶化，水和，分散，付着，拡展，浸透，崩壊，潤滑などの諸効果を示しそれらの機能を求めて界面活性剤は，農薬製剤のあらゆる剤型に使用されている。

(2) 界面活性剤の種類と分類

界面活性剤は，水に溶解したときイオンに解離するイオン性界面活性剤と，解離しない非イオン性界面活性剤とに大別される。イオン性界面活性剤はさらに電離の型によって陰イオン（アニオン）性界面活性剤，陽イオン（カチオン）性界面活性剤，両性界面活性剤に分類される（図1）。アニオン性界面活性剤は，水中でイオン解離したとき疎水基のついている部分がアニオンになる界面活性剤であり，その種類にはカルボン酸塩（−COOM），硫酸エステル塩（$-OSO_3M$），スルホン酸塩（$-SO_3M$），リン酸エステル塩（$-OPO_3M_2$，$-O\diagdown\diagup PO_2M$）などがある。カチオン性界面活性剤は，水中でイオン解離したとき疎水基のついている部分がカチオンになる界面活性剤であり，典型的なものに原体の溶解や効力促進に有効な第四級アンモニウム塩がある。

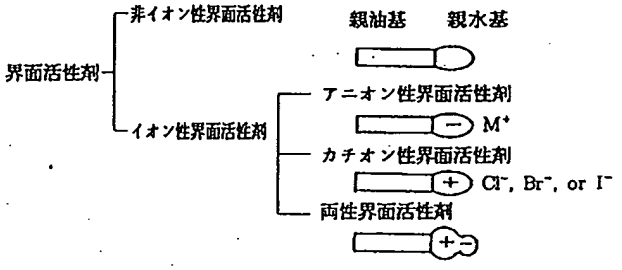

図1　界面活性剤の分類

両性界面活性剤は，疎水基にカチオンとアニオンの双方がついている界面活性剤でグリシン型とベタイン型とがあり，双方ともアルカリ性ではアニオン性，酸性ではカチオン性界面活性剤として作用する。両性界面活性剤は，他の工業分野での用途開発は活発だが農薬工業での利用はこれからである。

なお，イオン性界面活性剤が電離したとき，電離した界面活性イオンの相手のイオンを対イオンという。

非イオン性界面活性剤にはポリエチレングリコール型と多価アルコール型があり，中でも親水基としてエチレンオキサイドを付加したポリエチレングリコール型は，エチレンオキサイドの付加モル数を調節することにより多様な界面活性を得ることができるので農薬製剤では欠かせない界面活性剤である。

表1は，農薬製剤用に使用されている主要な界面活性剤の種類と用途を示している。

界面活性剤は使用目的により単独で用いる以外にその複合効果を引き出すため2種類以上を混用することがあるがその場合，下記の点に注意する必要がある。

①アニオン性とカチオン性の混合は，界面活性効果を著しく低下させる。